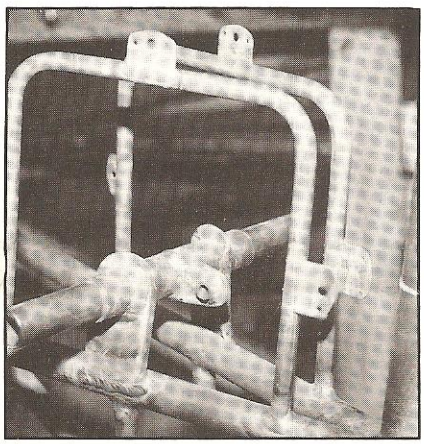
ACRO SPORT II MODIFICATIONS

By Neil Sidders of Monroe, Louisiana, Contributing Editor

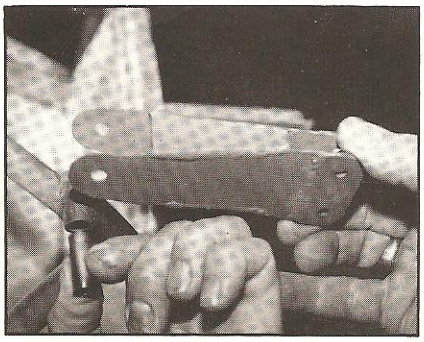
EDITOR'S NOTE: Neil Sidders, Bruce Owens and Robert Owens are building three Acro Sport IIs. The photos that follow were not taken from just one aircraft.

I don't know how common 7/8" tubes are on this type of aircrft, but I think they are probably about standard. At first, we welded the hinge blocks in place. This caused a great deal of warpage. So we began using silver solder to attach the blocks. We are still welding the bushing stock in place. It should be noted that the collars on either side of the hinge bushing should be the last thing to weld on the rudder and elevator spars. The elevator should be bolted together at the control horn and be on the airplane, then work from the center out. Otherwise, shrinkage from welding may cause the hangar to bind.

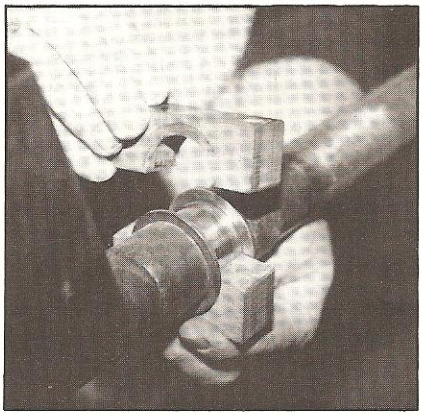


This shows how we are building our elevator carry thru spars.

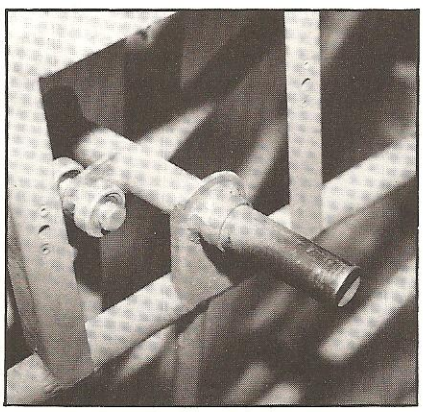
In the building of our Acro Sport biplanes, we discovered what we felt were some serious shortcomings in the control system. As it turns out, this is the way things have been done for years and it seems to have been sufficient. With the new wave of competitiveness, we are now flying our airplanes harder than ever. What was once "good enough" may not cut it anymore, and with safety being an ever present and growing concern, it is time we take a good, hard look at how we build things.



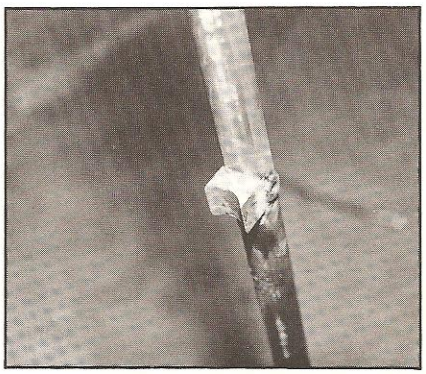
In the Acro Sport plans, all the idler fittings in the elevator push pull tube assembly swing on a 1/4" AN bolt that is pushed through a short length of bushing stock that is welded into the airframe. If these bolts are torqued to their proper values, it will lock the system. What it should have is a bushing within the welded bushing stock with the inner bushing about .020" longer than the welded bushing material. We used heat treated steel bushing stock in the idlers, and the system is very smooth and has no slack at all.

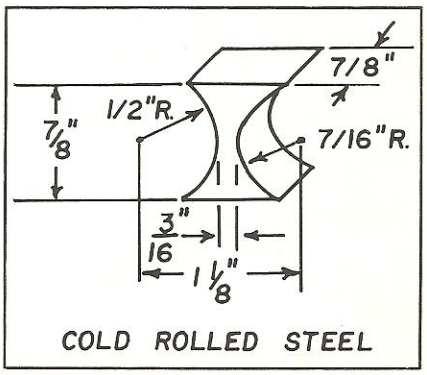


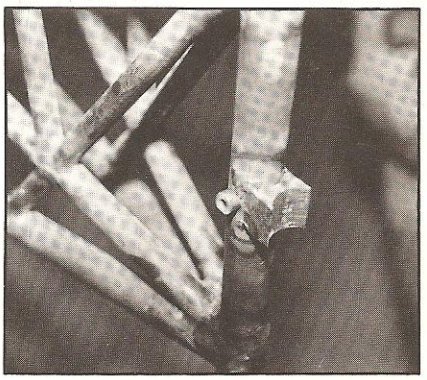
The second point of concern was the control torque tube thrust area. The drawing calls for a .058 x 1-5/8" tube collar on either side of the torque tube pillow block. We felt that the thrust area provided by the edge of this collar was inadequate and our fix was to make thrust faces for the collars from .090" 4130 flat stock. The inside diameter is 1.505" and the outside is 2". This provides 1.373 square inches per side, vs. .292 square inches. These "thrust washers" were silver soldered in place to minimize warpage.



The third improvement was on the stabilizer spar carry through tube assembly. As designed, the stabilizer slides on over the carry through tube and is held in place by a bolt passing through both tubes. The problem here is when the tail brace wires are tightened, the bolt is placed in double shear. To eliminate the shear condition, we enlarged the holes in the uprights of the carry through assembly to 7/8". We then cut a length of 7/8 x .058" 4130 tubing the proper length to span the gap in the stabilizer spars. The carry through spar tube passes through the 7/8 tube. (Do this before you weld.) When assembled, the stabilizer spar seats against the 7/8 tube, rather than the bolt. The only function the bolt has now is to prevent the stabilizer from falling off when the brace wires are removed.



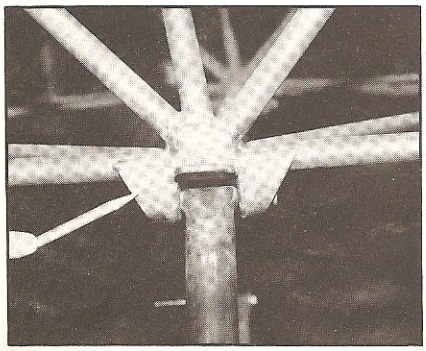




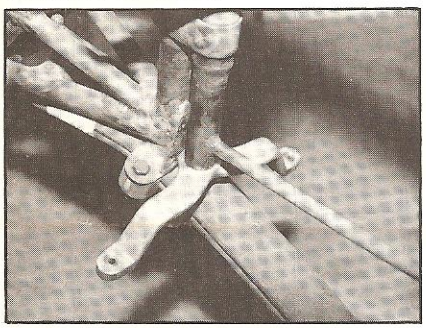
The fourth area of concern was with the elevator and rudder hinges. Most designs use a small piece of flat stock bent in a "V" shape for a seat for the hinge bushing. This provides only two small areas of contact for the bushing. In anticipation of a bunch of blown maneuvers, we wanted a little more security in these areas. Solid steel blocks were machined to accept the stabilizer spar in front and the hinge bushing out back. These were silver soldered to the stabilizer spar and they provide a very strong and secure seat for the hinge.

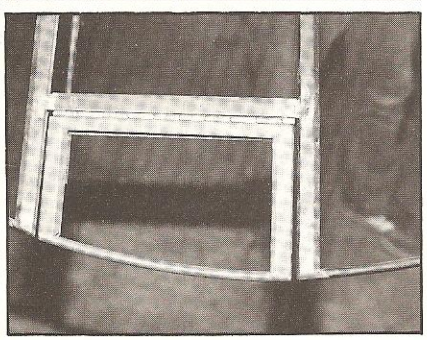
The last change we made was to the front landing gear attach fitting. The fitting was designed with a sharp 90 degree bend, which makes it very weak at this point. The Acro Sport Newsletter brought this out some time ago, but re-

cently I was looking at a Skybolt with the same problem, so I felt that it was worth mentioning again. The Acro Sport Newsletter shows a small, triangular gusset. This is good, but we went one step further and made a wrap around type gusset that gives even more support. The rear attach point serves only to stabilize the gear and does not require the modification.

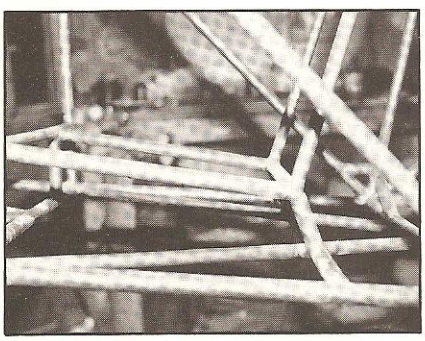


We spliced the rudder post so that the bottom of the tube was 7/8 x .058 to accept a J-3 steering arm. It looks a bit more professional and provides more clearance for turning.

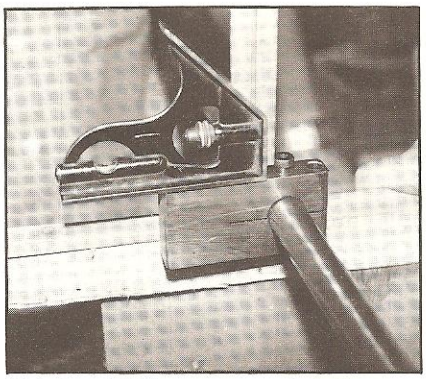




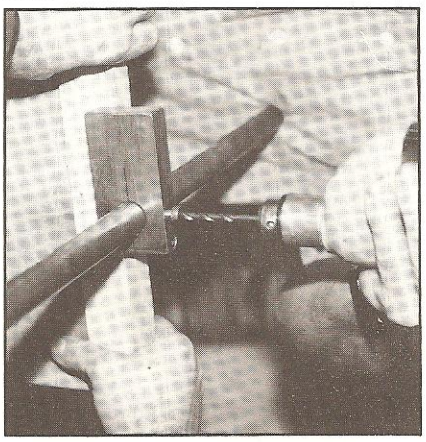
We built our trim tabs like this to maintain a more fluid contour on the elevator.



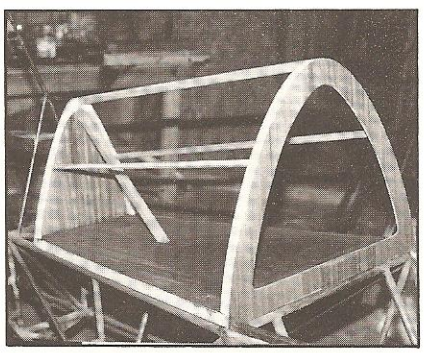
This shows a modification to the front seat to increase comfort for Debbie on cross country trips.

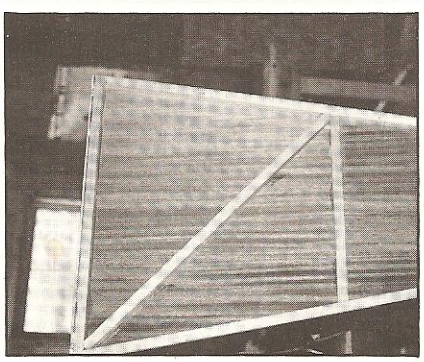


This is a drill fixture we made to be sure all the spars were drilled on CL for the hinges. Just level the airplane or part, then level the drill fixture and drill the hole.



A wood turtle deck on an Acro II! Lighter than aluminum and easier to make. The diagonal brace in the rear is a constant reminder against loading too far aft and helps keep things square. The skin is not glued to the side stringers. They help protect the skin from "airshow leaners". The Acro II Deck is shorter than the Acro I and shouldn't need the third bulkhead.





PLEXIGLASS HINTS

We have some additional plexiglass hints from Tony Hohenwalde that we didn't have room for in the last issue.

Taken from "The Airplane Factory, Inc.", Dayton, Ohio.

1. CUTTING: An abrasive disc powered by a high speed drill, a Dremel tool, or a hand held circular saw is recommended. We have found that abrasive cut-off wheels of aluminum oxide or silicon carbide provide excellent cutting results. A six inch disc is available at most hardware stores for around $3.50. A small grinding disc or Demel saw disc will also give good results. Reciprocating saws, like saber saws, are NOT RECOMMENDED and will probably break your canopy. A tool that progresses slow and hot to grind through the canopy is best. Tape a poly plastic cover on the canopy and mark your outline with masking tape. Never cut a cold canopy. Allow the canopy to warm to 70 degrees or more for at least an hour. Don't allow the canopy to vibrate or chatter during the cutting or it may chip and crack. Support your canopy on a flat surface so it will not twist or spread during the trimming. Duct tape is handy to hold things in place. Remember, cut slowly, don't push the cutter. Let the tool do the work. Be sure to use eye protection. Plexiglas chips can be a problem in your eyes since they are clear and difficult to see.

2. DRILLING: The drill should be ground off to a zero rake angle to prevent digging in, chipping and cracking the plexiglas. A standard drill bit, ground with no cutting edge pitch, is a safe method of making holes. Be sure to make the holes oversize to allow for motion caused by thermal expansion and contraction. The drill bit should not be allowed to chatter or it will chip and break the plexiglas.

3. CLEANING: A damp, soft cloth or an air blast will clean the saw dust away. The damp cloth will also dissipate static electricity. To clean dirty plexiglas, use plenty of water and a non abrasive soap or detergent. Dry with a clean chamois or soft cotton. NEVER use acetone, benzene, carbon tetrachloride, lighter fluid, lacquer thinners, leaded gasoline, window sprays or scouring compounds. Grease or oil may be removed with kerosene, white gasoline, naptha or isopropyl alcohol. Small scratches can be rubbed out with "Mirror Glaze" HGH-17 and a lot of rubbing. Hard, automobile paste wax should be applied as a protective coating and buffed with a soft cotton flannel cloth. Do not use cheesecloth, muslin or shop cloths, as they scratch. For deep scratch removal, procure a hand polishing kit from a plexiglas dealer or your canopy supplier.